

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-108433

(43)Date of publication of application : 24.04.1998

(51)Int.Cl.

H02K 29/00

(21)Application number : 08-256576

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(22)Date of filing : 27.09.1996

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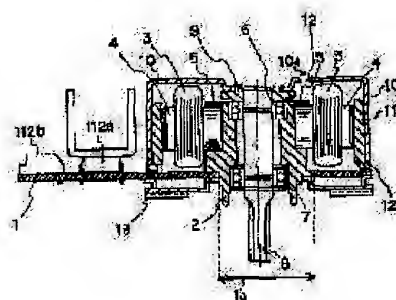
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## (54) BRUSHLESS MOTOR, EQUIPMENT WITH BUILT-IN MOTOR, AND JIG FOR PRESS FITTING

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To reduce the number of parts and assembling man-hours, by inserting a housing, inserted in a first hole in a printed board, into a second hole, and sandwiching the printed board between the stepped portion and the projected pieces of the housing to secure a mounting body.

**SOLUTION:** A first hole 1a is formed in a printed board 1, and a housing 2 is inserted into the first hole 1a. A mounting plate 13 is press fit into the housing 2 with the printed board 1 sandwiched. Subsequently, the housing 2 of a stator assembly is inserted into a second hole 13 in the mounting plate 13 with the supporting section of the printed board 1 in contact with the housing 2, and is depressed. Thereby the projected pieces on the mounting plate 13 are press fit into the side of the housing 2, and the supporting section of the printed board 1 is clamped between the stepped portion of the housing 2 and the projected pieces and secured. Thereafter, rotation can be brought into balance by actually rotating the rotor assembly using the drive circuit within the rotor assembly to measure eccentricity, and applying putty 12 to a rotor yoke 10.



### LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

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CLAIMS

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[Claim(s)]

[Claim 1] It has the 1st hole which engages with the step of this housing and performs a positioning of the path of insertion and a hand of cut for the aforementioned housing. housing which has a step for substrate pinching and fixed the stator core at least, and; -- It has the 2nd hole which the piece of vegetation for pressing fit in the printed circuit board and the; aforementioned housing which inserted the aforementioned housing in this 1st hole was made to correspond to the aforementioned step, and prepared it. The brushless motor characterized by providing the adapter plate which inserted the aforementioned housing inserted in the 1st hole of the aforementioned printed circuit board in the 2nd aforementioned hole, put the aforementioned printed circuit board by the aforementioned step and the aforementioned piece of vegetation of the aforementioned housing, and was fixed, and;

[Claim 2] It has the 1st hole which engages with the step of this housing and performs a positioning of the path of insertion and a hand of cut for the aforementioned housing. housing which has a step for substrate pinching and fixed the stator core at least, and; -- It has the 2nd hole which the piece of vegetation for pressing fit in the printed circuit board and the; aforementioned housing which inserted the aforementioned housing in this 1st hole was made to correspond to the aforementioned step, and prepared it. The brushless motor characterized by providing the adapter plate which pressed the aforementioned housing inserted in the 1st hole of the aforementioned printed circuit board fit in the 2nd aforementioned hole, put the aforementioned printed circuit board by the aforementioned step and the aforementioned piece of vegetation of the aforementioned housing, and was fixed, and;

[Claim 3] The brushless motor characterized by carrying out caulking fixation of the step of the aforementioned housing and the piece of vegetation of the aforementioned adapter plate which put the aforementioned printed circuit board in a brushless motor according to claim 1.

[Claim 4] It is the brushless motor which supports and is characterized by having the section and the positioning section which performs the positioning of the aforementioned housing on which the notching section for pulling out to a background the lead wire pulled out from the coil with which the aforementioned printed circuit board is wound around the aforementioned stator core in the brushless motor according to claim 1 to 3, the roll off to the step of the aforementioned housing, and the step of the aforementioned housing are put.

[Claim 5] The brushless motor which makes a couple the status that supported the account of a front through the rotation axis to the aforementioned roll off, and opposite arrangement of the section was carried out in the brushless motor according to claim 4, and is characterized by having arranged n pairs of this to the aforementioned printed circuit board.

[Claim 6] The brushless motor characterized by preparing the support section which supports the aforementioned printed circuit board to the aforementioned adapter plate which put the aforementioned printed circuit board and was fixed by the aforementioned step and the aforementioned piece of vegetation of the aforementioned housing in the brushless motor according to claim 1 to 5.

[Claim 7] The brushless motor characterized by having made it correspond to the aforementioned positioning section of the aforementioned printed circuit board, and preparing a positioning height in the aforementioned housing in a brushless motor according to claim 4.

[Claim 8] The brushless motor characterized by providing the Rota yoke which is supported directly or indirectly in a brushless motor according to claim 1 to 3 by the shaft supported by the aforementioned housing free [ rotation ], and prepared the hole in the top.

[Claim 9] The brushless motor characterized by carrying out pressing fixation of the aforementioned Rota yoke soon at the aforementioned shaft in a brushless motor according to claim 8.

[Claim 10] The 1st hole which inserts housing and the; aforementioned housing which have the step for substrate pinching in which the breakthrough for a substrate positioning was formed, and a height for pressing, and fixed the stator core at least until it contacts the aforementioned step, It has the aforementioned height and the 3rd hole corresponding to the aforementioned breakthrough. to this 3rd hole the height of the aforementioned housing It has the 2nd hole which the wall surface of the aforementioned step and the aforementioned height was made to correspond, and prepared the piece of vegetation for pressing fit in the printed circuit board and the; aforementioned housing which inserted the aforementioned housing in the 1st aforementioned hole. The aforementioned piece of vegetation is pressed fit to the internal surface of the aforementioned height, inserting the 2nd aforementioned hole for the aforementioned housing inserted in the 1st hole of the aforementioned printed circuit board. The brushless motor characterized by providing the adapter plate which put the aforementioned printed circuit board by the aforementioned step and the aforementioned piece of vegetation of the aforementioned housing, and was fixed, and;

[Claim 11] a brushless motor according to claim 10 -- setting -- the aforementioned height -- supporting -- a tap -- a hole -- forming -- this -- supporting -- a tap -- the brushless motor characterized by pressing the piece of vegetation of the aforementioned adapter plate fit to the internal surface of the height of the aforementioned housing by supporting a hole

[Claim 12] It is the brushless motor characterized by the aforementioned printed circuit board having a component side and a soldering side in a brushless motor according to claim 1 to 11, and having formed the wiring pattern only in the aforementioned soldering side, and forming the pattern for frequency power generation corresponding to the magnet for the aforementioned frequency power generation in the aforementioned soldering side while the magnet for frequency power generation which rotates focusing on a rotation axis to the aforementioned component-side side has been arranged.

[Claim 13] The motor inclusion device characterized by incorporating a brushless motor according to claim 1 to 12.

[Claim 14] a pedestal and; -- the press section in a circle which protruded on this pedestal, and; -- the fixture for pressing characterized by providing the length presser-foot pin which a screw thread is prepared in the gage pin prepared so that it might project from this press section, and; point, and operates independently to the aforementioned pedestal, and;

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the fixture for pressing used when assembling motor inclusion devices, such as a brushless motor, a business machine incorporating this brushless motor, and storage, and a brushless motor.

[0002]

[Description of the Prior Art] It is pressing need for a demand of low-cost-izing to be strong, and to improve parts each of the motors itself, and it to improve assembly structure, since a brushless motor is used for the mechanical component of storage, such as business machines, such as a copying machine and a printer, and a hard disk drive unit, as one component part in it, and to plan a cost reduction.

[0003] As shown in drawing 17, the conventional brushless motor To the printed circuit board 122 which formed the pattern for frequency power generation, other wiring patterns, etc., and mounted the electronic parts 112, such as driver-IC 112a and socket 112b Position the stator core 120 which wound the coil 121 with a spacer 123, and \*\*\*\* is attached. The nose of cam of a coil 121 to the hole of a printed circuit board 122 after soldering to a printed circuit board 122 The housing 124 which attached ball bearings 125 and 126 in bearing 124b is inserted. While a stator core 120 is fixed to this housing 124 on a screw 113 and a stator assembly is made Pressing fixation of the flange 118 is carried out at a shaft 117, a magnet 116 is fixed to the Rota yoke 115, this Rota yoke 115 and flange 118 are fixed on a screw 114, and the Rota assembly is made, and this Rota assembly is attached to a stator assembly, and it is constituted.

[0004] The housing 124 used for this brushless motor fabricates to one attachment section 124a for attaching the motor itself in bearing 124b, a printer, etc. which attach the Rota assembly.

[0005] By the way, when the parts mark of the Rota assembly and a stator assembly are compared the case of this conventional brushless motor, there are more parts mark of a stator assembly overwhelmingly, and the process balance in a motor manufacturing process is bad. This is because it is indispensable requirements to attach a sub workpiece which is called a printed circuit board 122 and which mounted electronic parts at the stator assembly side at the position \*\*\*\*\* sake of the configuration of housing 124, or the coil 121.

[0006] Moreover, if it is not after making this printed circuit board sub workpiece, it is the cause that that a stator assembly cannot be made also has a bad process balance.

[0007]

[Problem(s) to be Solved by the Invention] Thus, in the conventional brushless motor mentioned above, since the printed circuit board which mounted electronic parts served as the indispensable configuration as a stator assembly, many parts inclined toward the stator assembly side, the process balance in a motor manufacturing process was bad, and moreover assembled, and there was a problem require many man days.

[0008] It was made in order that this invention might solve such a technical problem, parts mark are cut down so that a process balance may be improved, and it aims at offering the brushless motor which can plan cost reductions, such as business machines, such as a copying machine and a printer, and a driving gear, a motor inclusion device, and the fixture for pressing by reducing the number of assemblers.

[0009]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the brushless motor of invention according to claim 1 It has the 1st hole which engages with the step of this housing and performs a positioning of the path of insertion and a hand of cut for the aforementioned housing, housing which has a step for substrate pinching and fixed the stator core at least, and; -- It has the printed circuit board which inserted the aforementioned housing in this 1st hole, and the 2nd hole which the piece of vegetation for pressing fit in the aforementioned housing was made to correspond to the aforementioned step, and prepared it. The aforementioned housing inserted in the 1st hole of the aforementioned printed circuit board is inserted in the 2nd aforementioned hole, and the adapter plate which put the aforementioned printed circuit board by the aforementioned step and the aforementioned piece of vegetation of the aforementioned housing, and was fixed is provided.

[0010] In this invention according to claim 1, housing is inserted in the 1st hole of a printed circuit board, and the housing is inserted in the 2nd hole of an adapter plate, and by the step of housing, and the piece of vegetation of the 2nd hole of an adapter plate, a printed circuit board is put and it fixes.

[0011] While the spacer for a positioning used conventionally becomes unnecessary by this and parts are cut down, the number of assemblers can be reduced.

[0012] Housing which the brushless motor of invention according to claim 2 has a step for substrate pinching, and fixed the

stator core at least, The printed circuit board which has the 1st hole which engages with the step of this housing and performs a positioning of the path of insertion and a hand of cut for the aforementioned housing, and inserted the aforementioned housing in this 1st hole, It has the 2nd hole which the piece of vegetation for pressing fit in the aforementioned housing was made to correspond to the aforementioned step, and prepared it. The aforementioned housing inserted in the 1st hole of the aforementioned printed circuit board is pressed fit in the 2nd aforementioned hole, and the adapter plate which put the aforementioned printed circuit board by the aforementioned step and the aforementioned piece of vegetation of the aforementioned housing, and was fixed is provided.

[0013] Since in this invention according to claim 2 a printed circuit board is put and it fixes by the step of housing, and the piece of vegetation of an adapter plate by pressing housing fit in the 2nd hole of an adapter plate, while parts, such as a screw for fixing housing and an adapter plate and a screw, become unnecessary and cut down parts, the number of assemblers can be reduced.

[0014] The brushless motor of invention according to claim 3 is characterized by carrying out caulking fixation of the step of the aforementioned housing and the piece of vegetation of the aforementioned adapter plate which put the aforementioned printed circuit board in the brushless motor according to claim 1.

[0015] Since caulking fixation of the step and adapter plate of housing is carried out in this invention according to claim 3, parts, such as a screw for fixing housing and an adapter plate and a screw, become unnecessary.

[0016] It is characterized by having the section and the positioning section which performs the positioning of the aforementioned housing on which the notching section for the brushless motor of invention according to claim 4 pulling out to a background the lead wire pulled out in the brushless motor according to claim 1 to 3 from the coil with which the aforementioned printed circuit board is wound around the aforementioned stator core, the roll off to the step of the aforementioned housing, and the step of the aforementioned housing are put by supporting.

[0017] While in this invention according to claim 4 the position of housing is decided and supported in the positioning section of a printed circuit board and the step of housing is put on the section, roll off is made to enter more deeply than the step of housing. Moreover, a printed circuit board and housing can be fixed efficiently, without using the spacer which was being used conventionally, since the notching section was prepared so that lead wire could be pulled out to the background of a substrate.

[0018] The brushless motor of invention according to claim 5 makes a couple the status that supported the account of a front through the rotation axis to the aforementioned roll off, and opposite arrangement of the section was carried out in the brushless motor according to claim 4, and it is characterized by having arranged n pairs of this to the aforementioned printed circuit board.

[0019] In this invention according to claim 5, it is fixable by supporting with roll off and making the section into a couple, positioning a printed circuit board and housing.

[0020] The brushless motor of invention according to claim 6 is characterized by preparing the support section which supports the aforementioned printed circuit board to the aforementioned adapter plate which put the aforementioned printed circuit board and was fixed by the aforementioned step and the aforementioned piece of vegetation of the aforementioned housing in the brushless motor according to claim 1 to 5.

[0021] Since a printed circuit board is supported in the support section of an adapter plate in this invention according to claim 6, it projects with the step of housing, and it can carry out by not vibrating a printed circuit board, taking the structure which puts a printed circuit board and is fixed by the piece.

[0022] The brushless motor of invention according to claim 7 is made to correspond to the aforementioned positioning section of the aforementioned printed circuit board in a brushless motor according to claim 4, and is characterized by preparing a positioning height in the aforementioned housing.

[0023] Since in this invention according to claim 7 the positioning height of housing engages with the positioning section of a printed circuit board and a mutual position is decided, the special member as an object for a positioning, i.e., a spacer, becomes unnecessary.

[0024] The brushless motor of invention according to claim 8 is supported directly [ the shaft supported by the aforementioned housing free / rotation / in the brushless motor according to claim 1 to 3 ], or indirectly, and is characterized by providing the Rota yoke which prepared the hole in the top.

[0025] When in this invention according to claim 8 the Rota assembly is included in a stator assembly and it considers as the rotational-structure field, a rotation balance can be maintained without a printed circuit board by inserting the pin of the fixture for balance \*\*\*\*s in the hole of the top of the Rota yoke, and rotating the Rota fraction.

[0026] Moreover, in case an adapter plate is pressed fit in the rotational-structure field after that, the pin of the fixture for pressing can be inserted in the hole of the Rota yoke, and an adapter plate can be pressed fit to the rotational-structure field by receiving the force which this pin is made to contact a stator core etc. and presses an adapter plate, without applying addition to the Rota fraction.

[0027] The brushless motor of invention according to claim 9 is characterized by carrying out pressing fixation of the aforementioned Rota yoke soon at the aforementioned shaft in the brushless motor according to claim 8.

[0028] In this invention according to claim 9, by carrying out pressing fixation of the Rota yoke soon at a shaft, a flange becomes unnecessary and can cut down parts mark.

[0029] The brushless motor of invention according to claim 10 Housing which has the step for substrate pinching in which the breakthrough for a substrate positioning was formed, and a height for pressing, and fixed the stator core at least, It has the 1st hole which inserts the aforementioned housing until it contacts the aforementioned step, and the aforementioned height and the 3rd hole corresponding to the aforementioned breakthrough. The printed circuit board which inserted the height of the aforementioned housing in this 3rd hole, and inserted the aforementioned housing in the 1st aforementioned hole, It has the 2nd hole which the wall surface of the aforementioned step and the aforementioned height was made to correspond, and prepared the

piece of vegetation for pressing fit in the aforementioned housing. The aforementioned piece of vegetation is pressed fit to the internal surface of the aforementioned height, inserting the 2nd aforementioned hole for the aforementioned housing inserted in the 1st hole of the aforementioned printed circuit board, and the adapter plate which put the aforementioned printed circuit board by the aforementioned step and the aforementioned piece of vegetation of the aforementioned housing, and was fixed is provided.

[0030] In this invention according to claim 10, by preparing the step for substrate pinching which formed the breakthrough for a substrate positioning in housing, and the height for pressing, and preparing the 3rd hole corresponding to the height for pressing in a printed circuit board, pressing the piece of vegetation of an adapter plate fit to the internal surface of the height of housing, a printed circuit board can be put by the step of housing, and the piece of vegetation of an adapter plate, and it can fix. That is, a pressing intensity can be raised, while pressing becomes possible not only in the wall surface (position near a rotation axis) of a housing book soma but in other parts (position distant from the rotation axis) and the vibration at the time of motor rotation is reduced.

[0031] the brushless motor of invention according to claim 11 -- a brushless motor according to claim 10 -- setting -- the aforementioned height -- supporting -- a tap -- a hole -- forming -- this -- supporting -- a tap -- it is characterized by pressing the piece of vegetation of the aforementioned adapter plate fit to the internal surface of the height of the aforementioned housing by supporting a hole

[0032] the case of this invention according to claim 11 -- a height -- supporting -- a tap -- an adapter plate can be pressed fit in housing, without applying addition to the Rota fraction by attaching a fixture in a hole and drawing in it (sticking by pressure)

[0033] The brushless motor of invention according to claim 12 is characterized by the aforementioned printed circuit board having a component side and a soldering side, and having formed the wiring pattern only in the aforementioned soldering side, and forming the pattern for frequency power generation corresponding to the magnet for the aforementioned frequency power generation in the aforementioned soldering side, while the magnet for frequency power generation which rotates focusing on a rotation axis to the aforementioned component-side side has been arranged in the brushless motor according to claim 1 to 11.

[0034] In this invention according to claim 12, by forming the pattern for frequency power generation in a soldering side, what is necessary is coming to form all wiring patterns only in a soldering side, and the cost reduction of a printed circuit board can be planned.

[0035] It is characterized by the motor inclusion device of invention according to claim 13 incorporating a brushless motor according to claim 1 to 12.

[0036] In this invention according to claim 13, the cost of the whole motor inclusion device can be reduced.

[0037] The fixture for pressing of invention according to claim 14 possesses a pedestal, the press section in a circle which protruded on this pedestal, the gage pin prepared so that it might project from this press section, and the length presser-foot pin which a screw thread is prepared in a point and operates independently to the aforementioned pedestal.

[0038] An adapter plate can be pressed fit in housing by lengthening housing and drawing by the presser-foot pin, pressing an adapter plate, for example by the pedestal, since it constituted so that in this invention according to claim 14 it might lengthen to a pedestal and a presser-foot pin might be operated independently.

[0039] While the spacer for a positioning used conventionally, a screw, a screw, etc. become unnecessary and cut down parts by each above-mentioned invention, the number of assemblers can be reduced. And since the printed circuit board workpiece it was elegance in [ whose ] the stator assembly the part is made to become independent of a stator assembly and can be made, while various inclusion procedures can be constructed, the bias of the parts configuration of each assembly is eased and a process balance can also be improved.

[0040]

[Embodiments of the Invention] Hereafter, the gestalt of operation of this invention is explained in detail with reference to a drawing.

[0041] Drawing showing the configuration of the brushless motor of the 1st operation gestalt which drawing 1 requires for this invention, the plan with which drawing 2 was involved the top in the printed circuit board, drawing showing [ 3 ] the configuration of housing, drawing showing [ 4 ] the configuration of an adapter plate, and the drawing 5 are drawings showing the configuration of the Rota yoke.

[0042] In drawing 1, 1 is a printed circuit board. The pattern for frequency power generation, other wiring patterns, etc. are formed in the soldering side (inferior-surface-of-tongue side of drawing 1) of this printed circuit board 1. The electronic parts 112, such as driver-IC 112a and socket 112b, are mounted in the top (top side of drawing 1) of this printed circuit board 1. this printed circuit board 1 -- the 1st hole -- 1a is formed this 1st hole -- housing 2 is inserted in 1a The stator core 4 which wound the coil 3 is inserted in this housing 2 by drawing Nakagami. This stator core 4 is being fixed by pressing the fixed ring 5 fit in housing 2 from a top. The shaft 8 as a rotation axis is supported free [ rotation ] by bearings 6 and 7 by housing 2. Pressing fixation of the flange 9 is carried out at this shaft 8. Caulking fixation of the Rota yoke 10 is carried out at this flange 9. In addition, you may carry out caulking fixation of the Rota yoke 10 soon at a shaft 8. the hole for fixtures in the Rota yoke 10 -- 10a is prepared In the common-law marriage of this Rota yoke 10, the magnet 11 with which the main magnet (thing to a stator core) and the magnet for frequency power generation (magnet to a printed circuit board side) were really formed fixes. the soffit section of a magnet 11, or the hole of the Rota yoke 10 -- putty 12 is attached in 10a and the rotation balance of the Rota fraction is maintained As housing 2 pinches a printed circuit board 1, the adapter plate 13 is pressed fit in it. In addition, in addition to pressing, you may carry out caulking fixation of housing 2 and the adapter plate 13 which put the printed circuit board 1.

[0043] As shown in drawing 2, this printed circuit board 1 is called so-called one side substrate by which pattern printing was given only to one side. this printed circuit board 1 -- the 1st hole -- 1a, the roll off 1A, 1B, and 1C, and the positioning section -- 1 D, it supports and consists of the sections 1E, 1F, and 1G etc. Notching section 1H for letting the lead wire of a coil 3 pass to a

soldering side side are prepared in roll off 1A, 1B, and 1C. The substrate supporting structure is realized, using each \*\*\*\*\* 1E, 1F, and 1G and step 2D of housing 2 as a couple. In this example What is necessary is to be good at least and just to arrange n pairs at a time again, even if many [ still ], although considered as three pairs.

[0044] this drawing 2 -- a printed circuit board 1 -- a component-side (front face) side \*\*\*\* -- seeing -- the 1st hole -- spacing of the center of 1a to 60 degrees Three hall device 112c is mounted. Moreover, the soldering land which is not illustrated for soldering the lead wire from a coil 3 is formed in the soldering side side of this printed circuit board 1.

[0045] What was shown by the drawing middle point line is pattern 1I for frequency power generation currently formed in the soldering side side. This pattern 1I for frequency power generation separates and carries out frequency power generation of the thickness of a printed circuit board 1, and the gap to the magnet for frequency power generation of the Rota yoke 10 (fraction to the printed circuit board side of a magnet 11). Usually, although this gap has common 0.3 - 0.5 mm grade, it applies that about 3.5mm is satisfactory to a real proof and this one side substrate the result which experimented, for example in 24 pulses / sec, and 245rpm.

[0046] As shown in drawing 3 (a) and (b), housing 2 has step 2B, and 2D, 2J, 2L, 2G, the side faces 2A, 2C, 2E, 2F, 2K, and 2H and height 2I. The length of side face 2E is set up almost like the thickness of a printed circuit board 1. A printed circuit board 1 supports in the field of step 2J, and the sections 1E, 1F, and 1G are carried. Height 2I is prepared so that it may engage with positioning section 1D of a printed circuit board 1, and it positions the hand of cut of a printed circuit board 1 and the housing 2. Opposite arrangement is carried out through the shaft of housing 2, it is considering as the couple now, and step 2B of housing 2, 2D, and step 2J are 120 focusing on the shaft of housing 2 at this operation gestalt. At a degree spacing Three pairs are prepared.

[0047] it is shown in drawing 4 (a) and (b) -- as -- an adapter plate 13 -- the 2nd hole -- 13d of the notching sections for making the space where an operator solders the lead wire from support presser-foot-stitch-tongue 13c and the coil 3 which guides 13a, fixed-part 13b, such as a printer, and the printed circuit board 1 to the soldering land of a printed circuit board 1 -- preparing -- \*\*\*\*\* the 2nd hole -- the piece 14 of vegetation for pressing housing 2 fit is formed in 13a This piece 14 of vegetation is formed so that side face 2C (2I) and side face 2E of housing 2 may be touched. it is shown in drawing 1 and the drawing 5 -- as -- the top of the Rota yoke 10 -- center \*\*\*\* -- almost -- the equal distance -- it is -- and -- every 120 degrees spacing -- the hole for fixtures -- 10a Three places are prepared. this hole -- the pin of a fixture is inserted in 10a, in case the Rota assembly is made and a lump rotation balance is maintained moreover, this hole -- when 10a includes the Rota assembly in a stator assembly, the Rota assembly should cover a stator assembly -- \*\* -- since it becomes like, it is used also for the fixture which receives the stator assembly itself by subsequent work

[0048] Hereafter, with reference to drawing 6 - view 10 , the assembly procedure of the brushless motor of this 1st operation gestalt is explained.

[0049] As an assembly procedure of this brushless motor, three workpieces called a printed circuit board workpiece, the Rota assembly, and a stator assembly are assembled first.

[0050] When processing a printed circuit board, after equipping with a chip the soldering side (rear face) of the printed circuit board 1 in which the wiring pattern was formed, the electronic parts 112, such as driver-IC 112a, socket 112b, and hall device 112c, are inserted from the component-side (front face) side of a printed circuit board 1, and the printed circuit board workpiece 60 which is shown in drawing 6 is made by soldering the rear face of a printed circuit board 1 automatically.

[0051] When making the Rota assembly, pressing fixation of the shaft 8 is carried out at a flange 9. A magnet 11 is fixed in the common-law marriage of the Rota yoke 10. And the Rota assembly 61 which is shown in drawing 7 is made by carrying out caulking fixation of the Rota yoke 10 at the flange 9 which pressed the shaft 8 fit.

[0052] When making a stator assembly, bearings 6 and 7 are first fixed to housing 2. Then, the stator core 4 which wound the coil 3 around this housing 2 is inserted from a top, and the stator assembly 62 which is shown in drawing 8 is made by fixing a stator core 4 to housing 2 by pressing the fixed ring 5 fit in housing 2 from on this further. In addition, bearing 6 is good also as parts by the side of the Rota assembly 61, and its workability at the time of the direction where bearing 6 was being fixed to the shaft 8 inserting a shaft 8 in housing 2 is good.

[0053] Thus, after making three workpieces called the printed circuit board workpiece 60, the Rota assembly 61, and the stator assembly 62, the method of the assembly by various combination can be considered.

[0054] First, after fixing the printed circuit board workpiece 60 to the stator assembly 62, the procedure incorporating the Rota assembly 61 can be considered.

[0055] in this case, it is shown in drawing 9 -- as -- the housing 2 of the stator assembly 62 -- the 1st hole of the printed circuit board 1 of the printed circuit board workpiece 60 -- it inserts in 1a, a printed circuit board 1 supports, and the sections 1E, 1F, and 1G and step 2J of housing 2 are made to contact

[0056] It inserts in 13a, then, the status that the printed circuit board 1 supported and the sections 1E, 1F, and 1G were made to contact step 2J -- the housing 2 of the stator assembly 62 -- the 2nd hole of an adapter plate 13 -- By pressing, the piece 14 of vegetation of an adapter plate 13 is pressed fit in the side faces 2C and 2I (2A) of housing 2, a printed circuit board 1 supports, and the sections 1E, 1F, and 1G are put and fixed by the piece 14 of vegetation of step 2J and the adapter plate 13 of housing 2.

[0057] In this case, if the printed circuit board workpiece 60 is fixed to the stator assembly 62, a coil 3 will be soldered to a printed circuit board 1 after that, the Rota assembly 61 will be inserted, since an operation becomes possible by energizing in the drive circuit of the printed circuit board workpiece 60, the Rota assembly 61 can actually be rotated in an internal drive circuit, the status of eccentricity can be measured, putty 12 can be attached in the Rota yoke 10, and a rotation balance can be maintained.

[0058] Moreover, after including the Rota assembly 61 in the stator assembly 62 and considering as the rotational-structure field, the procedure which fixes the printed circuit board workpiece 60 to the rotational-structure field can be considered.



[0059] In this case, if the Rota assembly 61 is included in the stator assembly 62, it will become the rotational-structure field 64 which is shown in drawing 10. In the state of this rotational-structure field 64, since the energization to a coil 3 is impossible, the rotation balance of the Rota yoke 10 cannot be maintained. Then, the fixture 70 for a rotation balance is used in this case. the fixture 70 for this rotation balance -- Rota yoke 10 three holes -- pin 70a prepares in the position corresponding to 10a -- having -- \*\*\*\* -- this rotational-structure field 64 -- fixing -- three holes of the Rota yoke 10 -- pin 70a is inserted in 10a, and the Rota yoke 10 is rotated from the exterior by this pin 70a

[0060] The Rota yoke 10 is rotated with the fixture 70 for this rotation balance, putty 12 is attached in the Rota yoke 10, and a rotation balance is maintained.

[0061] then, the housing fraction of this rotational-structure field 64 -- the 1st hole of the printed circuit board 1 of the printed circuit board workpiece 60 -- it inserts in 1a, a printed circuit board 1 supports, and the sections 1E, 1F, and 1G and step 2J of housing 2 are made to contact

[0062] It inserts in 13a. then, the status that the printed circuit board 1 supported and the sections 1E, 1F, and 1G were made to contact step 2J -- the housing 2 of the stator assembly 62 -- the 2nd hole of an adapter plate 13 -- By pressing, the piece 14 of vegetation of an adapter plate 13 is pressed fit in the side faces 2C and 2I (2A) of housing 2, a printed circuit board 1 supports, and the sections 1E, 1F, and 1G are put and fixed by the piece 14 of vegetation of step 2J and the adapter plate 13 of housing 2.

[0063] in addition, this case -- housing 2 -- the 2nd hole of an adapter plate 13 -- when it inserts in 13a, the fixture for press is assigned from the upper part of the Rota yoke 10, and the pin of this fixture is made to contact the stator core 4 or the fixed ring 5 directly through the hole 10 of the Rota yoke 10. Thereby, an adapter plate 13 can be pressed fit in housing 2, without applying a load to the Rota assembly 61.

[0064] And assembly operation will be completed, if the lead wire from a coil 3 is soldered to the soldering land of a printed circuit board 1 and a check of operation is finally carried out.

[0065] Thus, by including the Rota assembly 61 in the stator assembly 62 previously, the machine part of a motor will be in the completion status mostly, and can simplify work only on the easy work and the check of operation which attach the printed circuit board workpiece 60 and the adapter plate 13 as a subsequent assembler.

[0066] Thus, according to the brushless motor of this 1st operation gestalt, the stator core 4 was inserted in housing 2, and the screw 113 has been deleted by having considered as the structure which presses the fixed ring 5 fit in housing 2 from on the, and fixes a stator core 4. Moreover, the screw 114 has been deleted by having considered as the structure which carries out caulking fixation of a flange 9 and the Rota yoke 10. furthermore, while preparing step 2J in housing 2, it corresponds to these step 2J -- making -- the 1st hole of a printed circuit board 1 -- it supported to 1a, the sections 1E, 1F, and 1G were formed, and the spacer 123 has been deleted by having put each \*\*\*\*\* 1E, 1F, and 1G by the piece 14 of vegetation of step 2J and the adapter plate 13 of housing 2, and having fixed. The number of assemblers of the whole motor was able to be reduced by curtailment of these parts mark.

[0067] Moreover, by having made the attachment section separate from housing 2, having considered as the tabular adapter plate 13, and having considered as the structure which puts a printed circuit board 1 by housing 2 and the adapter plate 13, and is fixed, the printed circuit board workpiece 60 can be made to become independent of the stator assembly 62, three assemblies called the stator assembly 62, the Rota assembly 61, and the printed circuit board workpiece 60 can be made simultaneously, and they can be assembled now in various sequence. Therefore, each of these assemblies 60, 61, and 62 can also be referred to as coalescing in one factory place currently assembled in the different factory place now. And since the bias was eased, the parts configuration of each assemblies 60, 61, and 62 has also improved the process balance.

[0068] Furthermore, it can prevent that a printed circuit board 1 vibrates at the time of motor rotation by supporting a printed circuit board 1 by two or more support presser-foot-stitch-tongue 13c of an adapter plate 13. Next, the brushless motor of the 2nd operation gestalt which starts this invention with reference to drawing 11 - view 15 is explained. Drawing showing the configuration of the brushless motor of the 2nd operation gestalt which drawing 11 requires for this invention, drawing showing 12 ] the configuration of housing, and the drawing 13 are drawings showing the configuration of an adapter plate. In addition, in each drawing, the same sign is given to the same configuration as the above-mentioned 1st operation gestalt, and the explanation is omitted.

[0069] In drawing 11, 81 is a printed circuit board. the 3rd hole with this printed circuit board 81 new to a printed circuit board 1 -- 81a is added the 3rd hole of this printed circuit board 81 -- height 82a of housing 82 is inserted in 81a. Pressing fixation of the flange 89 is carried out at the shaft 8. Height 89a for caulking is prepared in this flange 89. The Rota yoke 90 is being fixed to this flange 89 by caulking \*\*\*\*\* in height 89a. For this reason, as for the Rota yoke 90, the aperture of a center section becomes large rather than the Rota yoke 10 of the 1st operation gestalt. As a printed circuit board 81 supports in housing 82 and the sections 1E, 1F, and 1G are inserted into it, the adapter plate 93 is pressed fit in it.

[0070] As shown in drawing 12 (a) and (b), housing 82 has heights 82a and 82b, the steps 82D, 82J, 82L, and 82G, and the side faces 82A, 82C, 82E, 82F, 82K, and 82H. the tap for supporting self in height 82a at the time of a pressing manipulation -- a hole (supporting a tap hole) -- 82M are formed in shaft orientations. Breakthrough 82N for a positioning are formed in shaft orientations at height 82b. These breakthrough 82N are for performing position doubling of the hand of cut with a printed circuit board 81, the housing 82, and the adapter plate 93, and the pin of a fixture is inserted at the time of assembly. A printed circuit board 81 supports in the field of step 82J, and the sections 1E, 1F, and 1G are carried. the length of side face 82E -- a tap -- a hole -- it considers as the length which can form 82M. Opposite arrangement is carried out through the shaft of housing 2, it is considering as the couple now, and step 82D of housing 82 and step 2J are 120 focusing on the shaft of housing 2 at this operation gestalt. At a degree spacing Three pairs are prepared.

[0071] it is shown in drawing 13 (a) and (b) -- as -- the hole for housing 82 pressing in an adapter plate 93 -- 93d of end \*\*\*\*\* for making the space where an operator solders the lead wire from 93a, joint 93b, such as a printer, and the coil 3 to the soldering



land of a printed circuit board 1, and the holes 93e and 93f for fixtures -- preparing -- \*\*\*\*\* a hole -- the piece 94 of vegetation for pressing housing 82 fit is formed in 93a This piece 94 of vegetation is formed so that the internal surface of housing 82, i.e., side face 82A, step 82D, and side face 82C may be touched.

[0072] Hereafter, with reference to drawing 14 and the drawing 15, the assembly procedure of the brushless motor of this 2nd operation gestalt is explained.

[0073] As an assembly procedure of the brushless motor of this 2nd operation gestalt, like the 1st operation gestalt, first, three workpieces called a printed circuit board workpiece, the Rota assembly, and a stator assembly are assembled, and the Rota assembly is included in a stator assembly after that, and after considering as the rotational-structure field 95 which is shown in drawing 14, it is made what fixes the printed circuit board workpiece 96 to the rotational-structure field 95.

[0074] then, the housing fraction of this rotational-structure field 95 -- the 1st hole of the printed circuit board 81 of the printed circuit board workpiece 96 -- 1a -- inserting -- moreover, height 82a -- the 3rd hole -- it inserts in 81a, a printed circuit board 81 supports, and the sections 1E, 1F, and 1G and step 82J of housing 82 are made to contact

[0075] It inserts in 93a. then, the status that the printed circuit board 81 supported and the sections 1E, 1F, and 1G were made to contact step 82J -- housing 82 -- the hole of an adapter plate 93 -- By pressing, the piece 94 of vegetation of an adapter plate 93 is pressed fit in the side faces 2A and 2C and step 82D of housing 82, a printed circuit board 81 supports, and the sections 1E, 1F, and 1G are put and fixed by step 82j of housing 82, and the piece 94 of vegetation of an adapter plate 93.

[0076] In addition, since the Rota yoke 90 is in the unstable status in case an adapter plate 93 is pressed fit to the rotational-structure field 95 to which the printed circuit board workpiece 96 was applied, this fraction cannot be received.

[0077] Then, in this case, the fixture for pressing 100 which is shown in drawing 15 is used.

[0078] This fixture for pressing 100 is the press section 102 in a circle which protruded on the pedestal 101, the gage pin 103 prepared so that it might project from this press section 102, and a thing with which the screw thread (tap) was cut at the nose of cam and which lengthens and consists of a pin 104 for a presser foot. The press section 102 in a circle is a fraction on which the piece 94 of vegetation of an adapter plate 93 is put. This fixture for pressing 100 is made into 2 piece structure where lengthen to a pedestal 101 and the presser-foot pin 104 moves independently.

[0079] although housing 82 is inserted in an adapter plate 93 after putting an adapter plate 93 on this fixture for pressing 100 -- this time -- the 3rd hole of breakthrough 82N and the printed circuit board 81 of housing 82 -- it inserts, carrying out position doubling of the 93f of the holes of 81a and the adapter plate 93

[0080] and the housing 82 -- supporting -- a tap -- a hole -- when the length presser-foot pin 104 of the fixture for pressing 100 contacts 82M, the length presser-foot pin 104 is rotated -- making -- the screw thread -- supporting -- a tap -- a hole -- it thrusts into 82M

[0081] Then, by drawing near the length presser-foot pin 104 in the orientation of orientation S of the arrow head of drawing 15, fixing the pedestal 101 of the fixture for pressing 100 in the position The piece 94 of vegetation of an adapter plate 93 is pressed fit in the internal surfaces 82A, 82C, and 82D of housing 82, a printed circuit board 81 supports, and the sections 1E, 1F, and 1G are put and fixed by the piece 94 of vegetation of step 82J and the adapter plate 93 of housing 82.

[0082] Thereby, an adapter plate 93 can be pressed fit in housing 82, without applying a load to the Rota yoke 90.

[0083] And assembly operation will be completed, if the lead wire from a coil 3 is soldered to the soldering land of a printed circuit board 81 and a check of operation is finally carried out.

[0084] Thus, by including the Rota assembly in the stator assembly previously, the machine part of a motor will be in the completion status mostly, and can simplify work only on the easy work and the check of operation which attach the printed circuit board workpiece 96 and the adapter plate 93 as a subsequent assembler.

[0085] Thus, according to the brushless motor of this 2nd operation gestalt, by having considered as the structure which to say nothing of the effect of the above-mentioned 1st operation gestalt being acquired makes a taper configuration upper-limit section 89a of a flange 89 in addition to this effect, and carries out caulking fixation of the Rota yoke 90 by this upper-limit section 89a, asymmetry stops being generated in the bearing of housing 82, and a shaft 8 can be smoothly inserted in housing 82.

[0086] moreover, heights 82a and 82b are formed in housing 2, and it corresponds to these heights 82a and 82b -- making -- a printed circuit board 81 -- the 3rd hole -- 81a is prepared, holes 93e and 93f are formed in an adapter plate 93, and by using the fixture for pressing 100, after making each assembly coalesce and making it mostly even the rotational-structure field 95 of the completion status, a motor can be made Thereby, a motor can be attached now in the order of various assemblies.

[0087] Consequently, the number of assemblers of the whole motor can be reduced, preventing the fault which arises from having made each part into caulking structure and pressing structure.

[0088] Next, the brushless motor of other operation gestalt is explained with reference to drawing 16. As shown in this drawing, the brushless motor of this operation gestalt is the modification of the brushless motor of the 1st operation gestalt.

[0089] As for the housing 105 of this brushless motor, the upper-limit section 105a is made into the taper configuration for caulking. The taper of edge 105a is [ as opposed to / a shaft / besides ] 2mm by the inclination of 30 degrees. It is set as the depth of a grade.

[0090] asymmetry according an edge to caulking a caulking \*\* case although parts, such as housing, attach an about [ 0.5R ] taper to an edge and it is generally made to smooth a parts insertion of bearing etc. -- a bearing -- being generated -- after that -- bearing -- inserting -- \*\*\*\*\* -- \*\* Inserting by the case becomes impossible.

[0091] Then, in the case of the brushless motor of this operation gestalt, it is 2mm about upper-limit section 105a of housing 105. By considering as the taper configuration of the depth of a grade, to the bearing, it is not transmitted, asymmetry by caulking is carried out, and bearing can be post-installed in a bearing.

[0092] The assembly procedure of this brushless motor inserts a stator core 4 in housing 105 first, and several places of upper-limit section 105a of housing 105 are fixed outside after that, and it fixes a stator core 4 to housing 105 by caulking

\*\*\*\*\*. Then, ball bearings 6 and 7 are inserted in housing 105, and it fixes to it.

[0093] In the case of this brushless motor, the fixed ring 5 which was fixing the stator core 4 only by caulking \*\*, and was using upper-limit section 105a of housing 105 with the 1st and 2nd operation gestalt can be made unnecessary.

[0094] Thus, according to the brushless motor of this operation gestalt, the fixed ring 5 used with the 1st operation gestalt can be deleted, and the parts mark which constitute a motor can be cut down.

[0095] In addition, this caulking fixed structure cannot be overemphasized by that it can use also for the thing of the 2nd operation gestalt.

[0096]

[Effect of the Invention] It can assemble, while the spacer for a positioning used conventionally becomes unnecessary and cuts down parts, since it considered as the structure which puts a printed circuit board by the step of housing, and the piece of vegetation of an adapter plate, and is fixed according to this invention as explained above, and a man day can be reduced.

[0097] And while various inclusion procedures can be constructed by having made the printed circuit board workpiece contained in the stator assembly become independent of a stator assembly, the bias of the parts configuration of each assembly is eased and a process balance can also be improved.

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[Translation done.]

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] Drawing showing the configuration of the brushless motor of the 1st operation gestalt of this invention.

[Drawing 2] The plan as which the printed circuit board of the brushless motor of this 1st operation gestalt was regarded from the top.

[Drawing 3] (a) is the bottom view of housing of the brushless motor of this 1st operation gestalt. (b) is the A-A'cross section of housing of drawing 3 (a).

[Drawing 4] (a) is the plan as which the adapter plate of the brushless motor of this 1st operation gestalt was regarded from the top. (b) is the B-B'side view of the adapter plate of drawing 4 (a).

[Drawing 5] Drawing showing the Rota yoke of the brushless motor of this 1st operation gestalt.

[Drawing 6] Drawing showing a printed circuit board workpiece.

[Drawing 7] Drawing showing the Rota assembly.

[Drawing 8] Drawing showing a stator assembly.

[Drawing 9] Drawing showing a mode of a stator assembly and a printed circuit board workpiece that it incorporates.

[Drawing 10] Drawing showing a mode that a printed circuit board workpiece is incorporated after incorporating the Rota assembly and a stator assembly.

[Drawing 11] It is drawing showing the configuration of the brushless motor of the 2nd operation gestalt of this invention.

[Drawing 12] (a) is the bottom view of housing of the brushless motor of this 2nd operation gestalt. (b) is the C-C'cross section of housing of drawing 12 (a).

[Drawing 13] (a) is the plan as which the adapter plate of the brushless motor of this 2nd operation gestalt was regarded from the top. (b) is the D-D'side view of the adapter plate of drawing 12 (a).

[Drawing 14] Drawing showing the assembly procedure of the brushless motor of this 2nd operation gestalt.

[Drawing 15] Drawing showing the fixture for adapter plate pressing.

[Drawing 16] Drawing showing the configuration of the brushless motor of other operation gestalt.

[Drawing 17] Drawing showing the conventional brushless motor.

[Description of Notations]

1, 81 [ -- Housing, ] -- A printed circuit board, 1a -- The 1st hole, 2, 82, 105 2B, 2D, 2J, 2L, 2G -- A step, 2A, 2C, 2E, 2F, 2K, 2H [ -- A stator core, 5 / -- A fixed ring, 6 7 / -- Bearing, ] -- The side face, 3 -- A coil, 4 8 [ -- The Rota yoke, 11 / -- Magnet, ] -- A shaft, 9, 89 -- A flange, 10, 90 12 [ -- The piece of vegetation, 13a / -- The 2nd hole, ] -- Putty, 13, 93 -- An adapter plate, 14 13b [ -- The 3rd hole, 93a / -- The hole for pressing, ] -- A fixed part, 13c -- A support presser foot stitch tongue, 81a 100 [ -- The press section, 103 / -- A gage pin, 104 / -- The pin for a length presser foot 105a / -- The upper-limit section of housing, 112a / -- A driver IC, 112b / -- A socket, 112c / -- Hall device. ] -- The fixture for pressing, 101 -- A pedestal, 102

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[Translation done.]